

NON-PUBLIC?: N  
ACCESSION #: 9507060081  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Joseph M. Farley Nuclear Plant - Unit 2 PAGE: 1 OF 4

DOCKET NUMBER: 05000364

TITLE: Manual Reactor Trips Following a Loss of Electro-Hydraulic Fluid  
EVENT DATE: 6/01/95 LER #: 95-005-00 REPORT DATE: 06/29/95

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 30

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
NAME: R. D. Hill, General Manager - TELEPHONE: (334) 899-5156  
Nuclear Plant

COMPONENT FAILURE DESCRIPTION:  
CAUSE: X SYSTEM: SJ COMPONENT: SCV MANUFACTURER: W120  
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

#### ABSTRACT:

At 0058 on June 1, 1995 with the Unit 2 reactor in mode 1 operating at 30 percent power, the reactor was manually tripped following the loss of the operating (2A) steam generator feed pump (SGFP)SJ!. The loss of the SGFP was caused by a failed electro-hydraulic (EH) fluid supply line and subsequent loss of EH fluid. The failure was in the heat affected zone of the tubing-to-fitting socket weld on the EH supply to the high pressure governor valve to the 2A SGFP. Initially, the June 1, 1995 event was attributed to cyclic fatigue (pending the results of metallurgical analysis) caused by a loose support clamp, and higher than normal vibrations which are associated with feed pump operations at low power. The EH tubing and support clamp were repaired, and the failed tubing was sent off site for detailed failure analysis. The unit was returned to power operation at 1912 on June 2, 1995 using 2B SGFP as the operating feedpump. Subsequently, at 0948 on June 3, 1995, with the

reactor operating at 33 percent power, the reactor was manually tripped following the loss of the operating (2A) SGFP caused by a failed EH fluid supply line on the 2A SGFP and subsequent loss of EH fluid.

Examination of the failed tubing revealed that the failures experienced on June 1, 1995 and June 3, 1995 were sudden impact failures caused by servovalve failures which resulted in mechanical and hydraulic oscillations in the EH system. Portions of the EH tubing were replaced, clamps and supports were inspected and repaired, and servovalves were replaced (June 3, 1995 trip only). The unit was returned to power operation at 1515 on June 5, 1995.

END OF ABSTRACT

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#### Plant and System Identification

Westinghouse - Pressurized Water Reactor

Energy Industry Identification System codes are identified in the text as XX!.

#### Description of Event

At 0058 on June 1, 1995 with the Unit 2 reactor in mode 1 operating at 30 percent power, the reactor was manually tripped following the loss of the operating (2A) steam generator feed pump (SGFP)SJ!. The loss of the SGFP was caused by a failed electro-hydraulic (EH) fluid supply line and subsequent loss of EH fluid. The failure was in the heat affected zone of the tubing-to-fitting socket weld on the EH supply to the high pressure governor valve to the 2A SGFP. This failure was initially considered similar to an April 9, 1991 event which resulted in a manual reactor trip following a loss of the operating (2A) SGFP while operating at 34 percent reactor power (LER 91-002-Unit 2). The cause of the April 9, 1991 event was attributed to cyclic fatigue failure in the heat affected zone of a tube-to-fitting socket weld on the EH supply to the high pressure governor valve to the 2A SGFP. Corrective action in response to the 1991 event included the installation of additional hanger supports due to higher than normal vibrations which occur during periods of low power operation.

The June 1, 1995 failure occurred in the same location as the April 9, 1991 failure. Initially, the June 1, 1995 event was attributed to cyclic fatigue (pending the results of metallurgical analysis) caused by a loose support clamp, and higher than normal vibrations which are associated with feed pump operations at low power. Portions of the EH tubing was

repaired and/or replaced. Additionally, supports were inspected and repaired as appropriate and the failed tubing was sent off site for detailed failure analysis. The unit was returned to power operation at 1912 on June 2, 1995 using 2B SGFP as the operating feedpump. Subsequently, at 0948 on June 3, 1995, with the reactor operating at 33 percent power, the reactor was manually tripped following the loss of the operating (2A) SGFP. The loss of the 2A SGFP was caused by a failed EH fluid supply line on the 2A SGFP and subsequent loss of EH fluid. The failure occurred in the same socket weld area as the April 9, 1991 and June 1, 1995 events. Following an investigation and subsequent corrective actions the EH system was returned to service. While monitoring the system following repairs, excessive EH tubing vibrations were observed. The abnormal vibrations were due to excessive mechanical and hydraulic oscillations of the 2A SGFP HP and LP governor valves. An investigation determined that the excessive mechanical and hydraulic oscillations were due to the failure of the SGFP HP and LP governor valves servovalves. The servovalves were replaced and the unit was returned to power operation at 1515 on June 5, 1995 while vibration monitoring of the EH system continued.

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#### Cause of Event

Metallurgical analysis of the failed tubing revealed that the EH tubing failures experienced on June 1, 1995 and June 3, 1995 were sudden impact failures. A stress analysis of the tubing section revealed that a stress, possibly significantly above the ultimate tensile strength of the stainless steel tubing, could have been generated during the periods of excessive mechanical and hydraulic oscillations caused by the servovalve failures. The failure of the servovalves subjected the EH tubing to excessive mechanical and hydraulic oscillations due to the resultant EH pressure surges as the servovalves called for full closure or full open of the respective SGFP governor valve. The servovalve failures were attributed to a degradation of the EH fluid as a result of moisture intrusion. The moisture intrusion resulted in an increase in the acidity and decrease of resistivity levels of the EH fluid which exceeded the established EH system parameters.

Following the June 3, 1995 event, the servovalves associated with the 2A SGFP were sent to the manufacturer for testing and failure cause determination. The results indicated excessive oscillation on the test stand. An inspection revealed a plugged internal filter and worn and/or eroded internal surfaces. These test and inspection results were consistent with the expected effects due to moisture intrusion into the

EH system.

#### Safety Assessment

All safety systems operated as designed.

This event would not have been more severe if it had occurred under different operating conditions.

#### Corrective Action

Following the June 1, 1995 event:

The EH tubing was repaired and selected welds on the EH system of 2A and 2B SGFP were dye penetrant tested satisfactory.

EH piping supports and clamps were inspected and repaired as appropriate.

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The failed area of tubing was removed and initial visual inspections concluded the failure was most probably due to cyclic fatigue similar to the 1991 event. The tubing was sent off site for detailed metallurgical analysis.

Vibration analysis was performed on 2A SGFP EH system tubing

Following the June 3, 1995 event:

The EH tubing was repaired and selected welds on the EH system of 2A and 2B SGFP were dye penetrated tested and satisfactory.

The servovalves associated with the 2A and 2B SGFPs were replaced.

A metallurgical analysis was completed on the failed tubing associated with the June 1, 1995 and June 3, 1995 events. Analysis indicated the failure was categorized as a sudden impact failure.

Increased attention has been devoted to maintaining EH fluid parameters within established specifications. In addition, site specific (Units 1 and 2) EH fluid parameters are being reviewed for potential inclusion of additional industry and manufacturer recommendations.

#### Additional Information

Unit 1 EH fluid parameters were verified to be within established specifications.

The following LER involved a manual reactor trip due to a failed EH supply line:

LER 91-002 (Unit 2) - Reactor Manually Tripped Following Loss of Steam Generator Feed Pump.

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Dave Morey Southern Nuclear Operating Company  
Vice President  
Farley Project the southern electric system

June 29, 1995

Docket No.: 50-364 10 CFR 50.73

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555

Joseph M. Farley Nuclear Plant - Unit 2  
Licensee Event Report No. 95-005-00  
Manual Reactor Trips Following a Loss of Electro-Hydraulic Fluid

Ladies and Gentlemen:

Joseph M. Farley Nuclear Plant Licensee Event Report No. 95-005-00 is being submitted in accordance with 10 CFR 50.73. If you have any questions, please advise.

Respectfully submitted,

Dave Morey

DPH:maf MRXTFEH.DOC

Enclosure

cc: Mr. S. D. Ebnetter  
Mr. B. L. Siegel  
Mr. T. M. Ross

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